



# **Hurricanes Affecting the Republic of Haiti (1901-2009)**

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# TC activity making landfall\* on the Republic of Haiti (1905-2009):

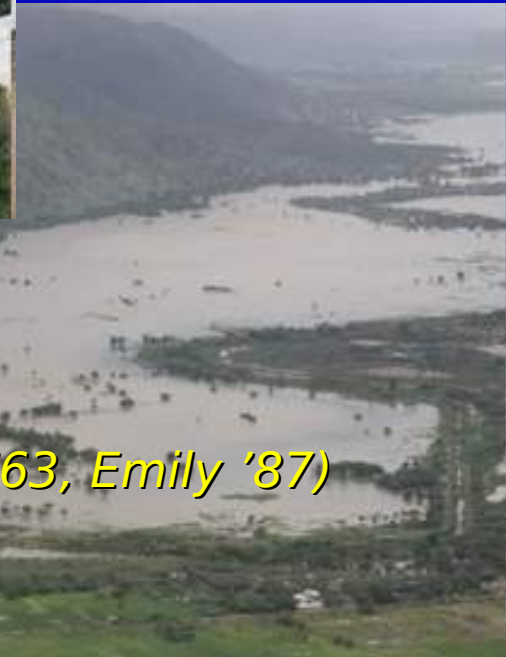
**4 consecutive TCs in 2008 devastate Gonaïves**



- **23 Hurricanes (only 5 major, CAT III or higher)**
- **25 tropical storms**
- **8 tropical depressions**



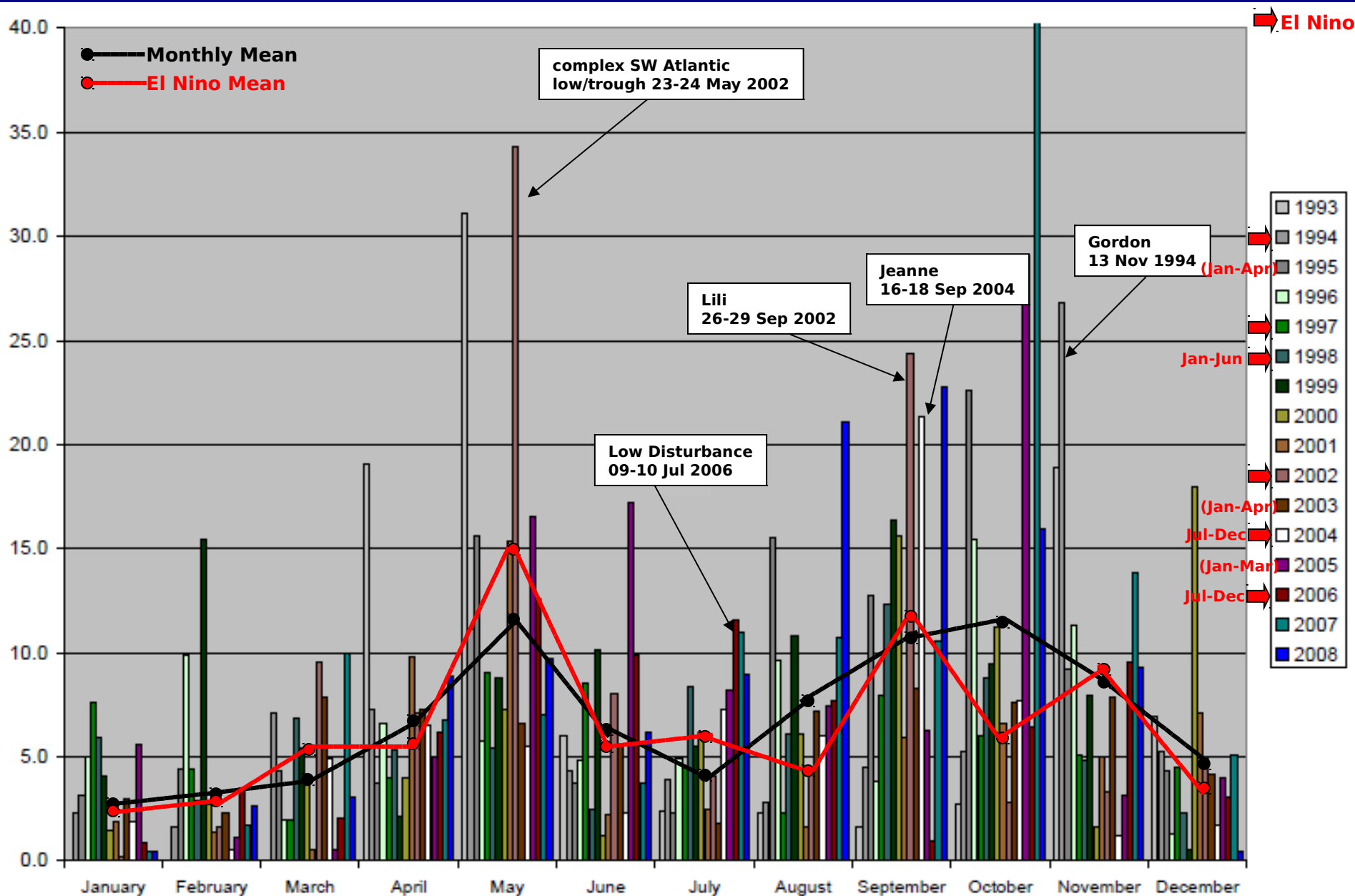
- Month of highest frequency: September, (August is 2<sup>nd</sup>) (none in June, only 1 TC ever recorded in July!)
- Majority of activity: During Neutral/La Nina ENSO  
**18 El Nino phases since 1950: only 2 TC landfalls (Flora '63, Emily '87)**



\* Includes tracks entering Haiti from the Dominican Republic



## Southern Peninsula of Haiti

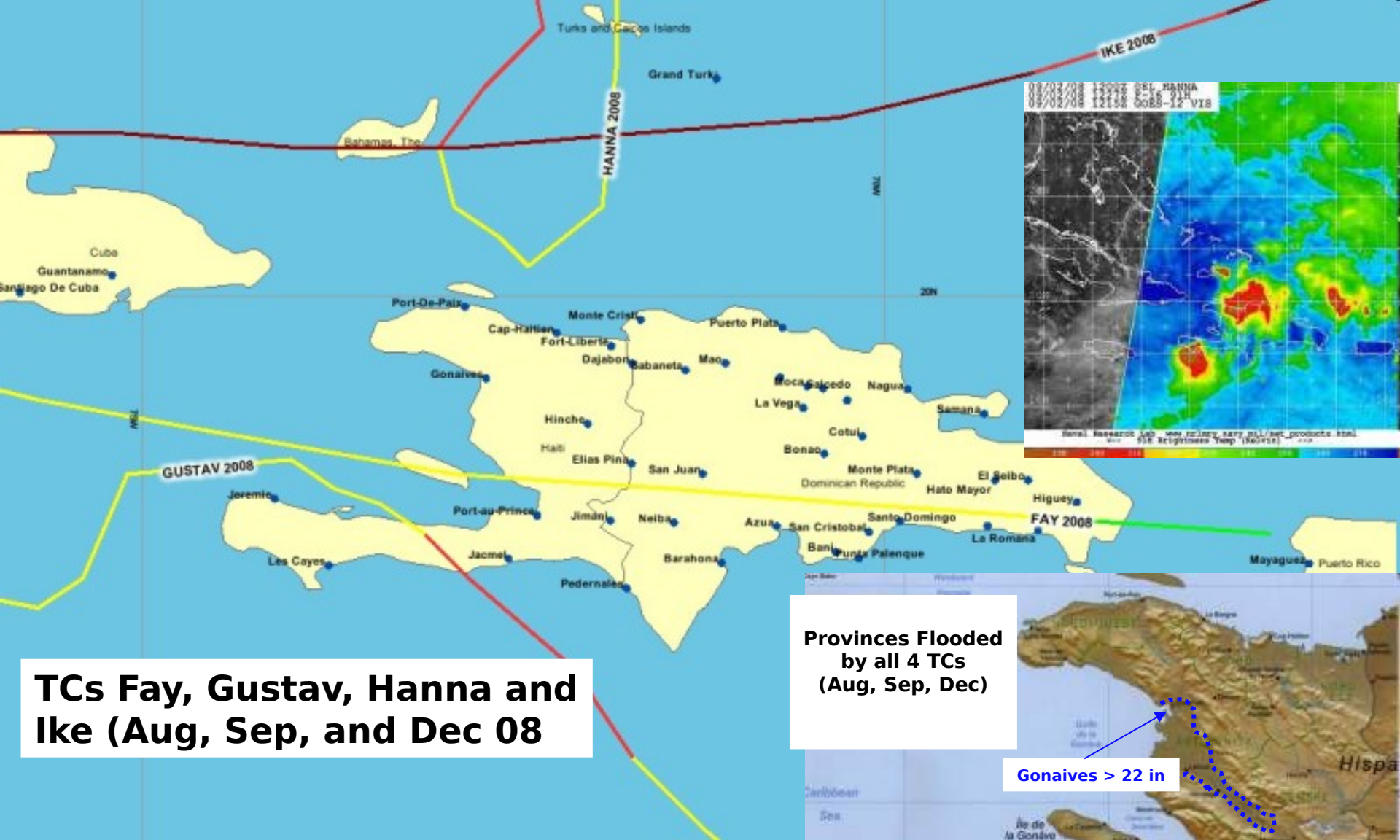




## **19 Tropical Cyclones that have adversely affected Haiti during the past 25 years (1984-2009)**

*5 Hurricanes (2 major), 11 tropical storms, and 3 depressions*

Tropical Cyclones and Haiti (1984-2009)					
	DATE OF passage	MAXIMUM WINDS (DURING closest approach)	RAINFALL AMOUNT (INCHES)	DIRECT DEATHS	ESTIMATED DAMAGE (\$ million)
* Fatalities from Gonaïves. Total perished from all 4 storms (2008) is estimated at 793.					
TS ISABEL	07 OCT 85	40 kt		0	
MH EMILY	22-23 SEP 87	70 kt		0	30
TS CHRIS	25 AUG 88	30 kt	3-8	0	
TS CINDY	16 AUG 93	30 kt	4-7 (10 max)	2	
H GORDON	12-13 NOV 94	40 kt	4-14 (22 max)	1122	
MH GEORGES	22-23 SEP 98	65 kt	12-34	209	179
TS DEBBY	23 AUG 00	60 kt	surf/surge	0	
MH LILI	28 SEP 02	45 kt	4-6 (>13 max)	12	
TS ODETTE	06 DEC 03	50 kt	5-6	0	
MH IVAN	10 SEP 04	125 kt	>8	2	
H JEANNE	17 SEP 04	30 kt	7-10 (14 max)	3006	
TS ALPHA	23 OCT 05	35 kt	5-12 (23 max)	17	
H ERNESTO	27 AUG 06	40 kt	3-11 (15 max)	5	
H NOEL	29 OCT 07	45 kt	4-16 (26 max)	73	14
TS OLGA	11 DEC 07	50 kt	4-7 (15 max)	2	



# TCs Fay, Gustav, Hanna and Ike (Aug, Sep, and Dec 08)

Provinces Flooded by all 4 TCs (Aug, Sep, Dec)

Gonaives > 22 in

Camp Perrin >12 in

4 ft Storm surge in Benet and

TS Hanna was actually the system that triggered the devastating flooding in the Artibonite province (Gonaives). Unbelievably, Hanna produced a total of over 12 inches in Camp Perrin, causing the Macaya watershed to spill over the city.



# DFO Event # 2008 - 3373 - Haiti - Rapid Response Inundation Map

MODIS flood inundation limit  
September 5, 2008: ■  
Maximum Observed Inundation  
Limit 2003 - 2007: ■

SRTM SWBD reference water: ■  
DCW Rivers: — Urban Areas: ■

Universal Transverse Mercator  
UTM Zone 19 North  
WGS 84 - Graticule: 2 degrees  
Shaded Relief from SRTM data

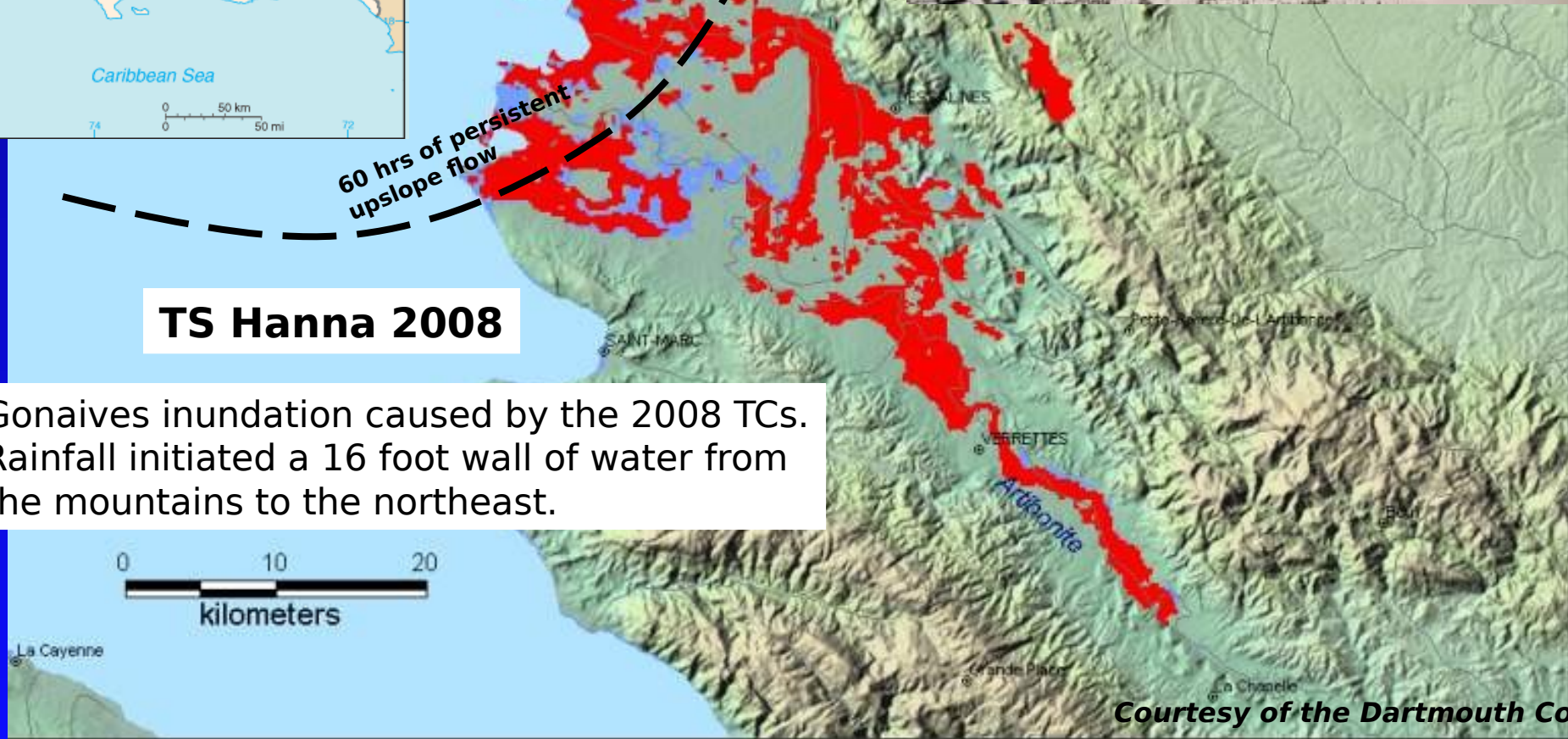
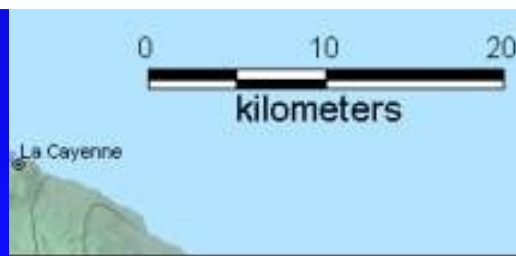
Copyright 2008  
Dartmouth Flood Observatory  
Dartmouth College  
Hanover, NH 03755 USA  
Chris Farmer, G. R. Brakenridge



60 hrs of persistent  
upslope flow

## TS Hanna 2008

Gonaïves inundation caused by the 2008 TCs.  
Rainfall initiated a 16 foot wall of water from  
the mountains to the northeast.



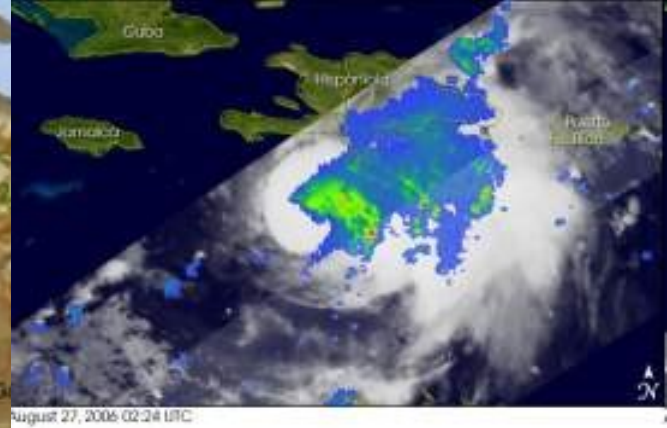
Courtesy of the Dartmouth College



Departments/Provinces  
Flooded in 2007:  
TS Noel (29 Oct)  
TS Olga (11 Dec)

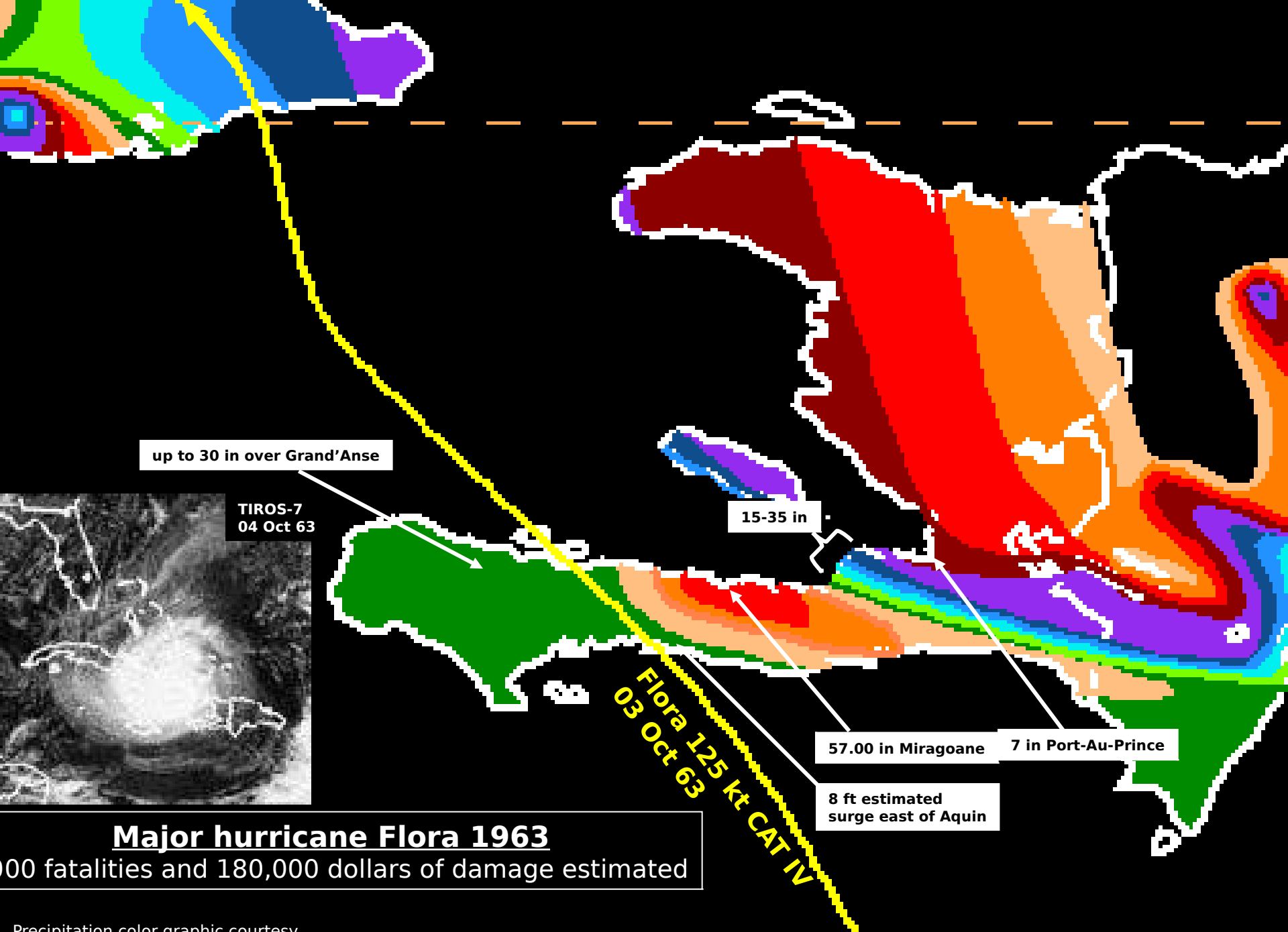






## Flooding from TS Ernesto 2006





## Major hurricane Flora 1963

000 fatalities and 180,000 dollars of damage estimated



# In Summary

- ❑ Flash flooding, creating mud slides, is the primary damaging force of nature in the Republic of Haiti. The semi-annual wet seasons (Apr-Jun and Oct-Nov) must also be taken into account (ENSO influences as well). The deforestation of the republic since the 1950's has certainly elevated the mudslide threat. Less than 2% of the forests remain.
- ❑ Although the El Nino/warm phase of ENSO causes slightly lower than normal precipitation amounts over Haiti, the warm phase synoptic pattern can produce anomalous increases in precipitation, particularly during the spring and early summer. Mid-latitude storm tracks move south into the greater Antilles and can become "cut-off" from the polar/subtropical jet winds. These complex low/trough systems can linger over Hispaniola for days producing 15 to 20 inches of rain. On the other hand, persistent wind shear/upper westerlies will suppress TC activity in the Caribbean Sea. However, African Easterly Waves still can be menacing to the island producing up to 8 inches over the southern peninsula.
- ❑ Enhanced rainfall amounts due to up-sloping flow can quickly produce devastating effects in the lower elevation cities...particularly in the Departments/provinces of Artibonite (*Gonaives*), Ouest (*Port-Au-Prince*), and Nippes (*peninsula*).
- ❑ Tropical cyclones traversing the republic from the southeast to south are far more destructive in the Departments of Nippes (northern portion of the peninsula and central portion of the Sud/Camp Perrin), and the Ouest (includes Port-Au-Prince). Additionally, the southern portion of the Peninsula is susceptible to storm surge.
- ❑ Long-term mean, expect a total of at least 4 to 8 inches in the lower elevations and up to 17 inches in the higher terrain, regardless of TC track orientation.